Watershed Protection: A Project Focus
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Chapter 6: Setting Goals and Identifying Solutions

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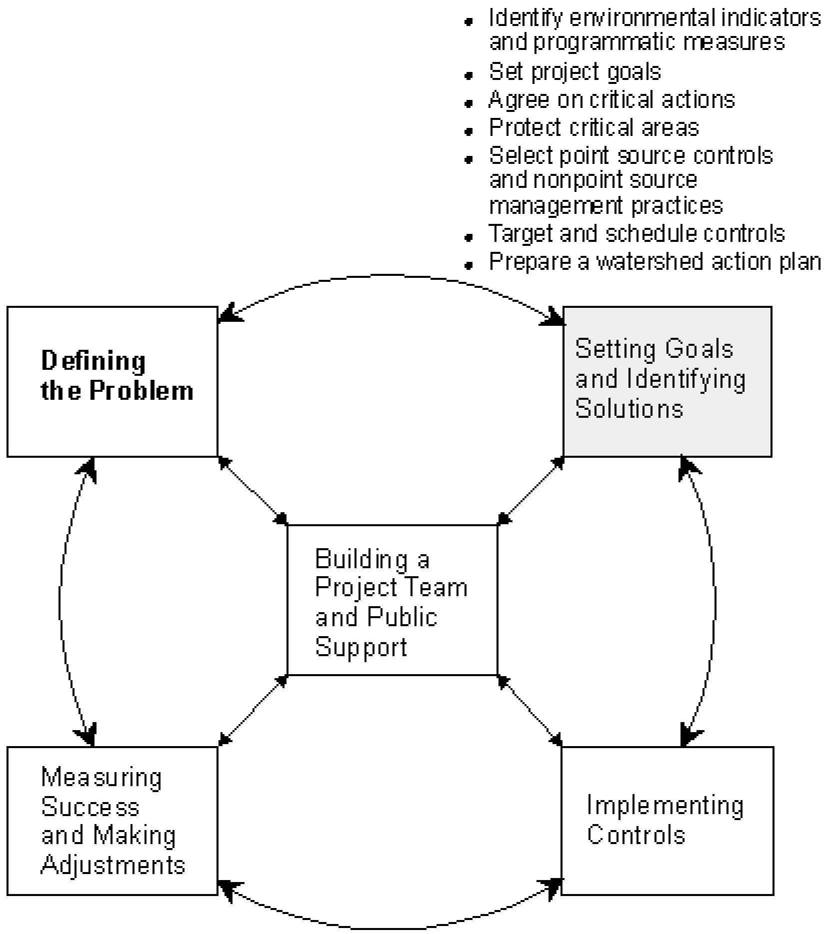

This chapter describes activities that result in specific goals and objectives for the watershed project and the selection of management measures to achieve these goals. The end product of these activities is usually some form of action plan for the watershed.

Identify Environmental Indicators and Programmatic Measures

Environmental indicators are measures that can be used to characterize a particular watershed's condition and improvement (i.e., how well a watershed project is meeting its goals and objectives). By identifying the universe of potential indicators before setting goals, planners will ensure that no key aspect of the watershed's ecological and human health and welfare is overlooked.

Environmental indicators can range from measures of administrative or programmatic accomplishments (e.g., the number of TMDLs developed or BMPs implemented) to measures of true environmental improvements (e.g., the maintenance over a specific time period of healthy, reproducing populations of fish, macroinvertebrates, aquatic vegetation, and terrestrial wildlife). Agencies and the public are most interested in direct measures of a watershed's condition; however, in the early years of a watershed project measures usually will include a mix of direct environmental indicators and programmatic measures.

Table 6-1 shows one way of categorizing environmental indicators, along with examples (adapted from Urban Institute, 1992). Indicators in Table 6-1 represent a continuum from administrative or programmatic measures in the top row to direct measures of ecological health in the bottom row. EPA's Office of Water is currently working to develop a set of national environmental indicators for human health and ecological protection.

Set Project Goals

Identify Potential Solutions for Each Type of Water Quality Problem in the Watershed

Before Setting overall project goals (discussed below), it is useful to identify potential solutions for each type of problem identified in the watershed. This identification of problems and solutions will facilitate an exchange of ideas and make sure that no options are overlooked. For example, many people are oriented toward structural controls such as wastewater treatment systems or certain BMPs. But in reality, comprehensive watershed protection often requires structural BMPs *combined with* public education, economic incentives and, in some cases, regulations, land use controls, or habitat restoration.

Table 3. Examples of Environmental Indicators

Description of Indicator Type or Category	Examples of Indicators
Document the extent to which programmatic and regulatory actions have been taken	Number of permits reissued with new limits Number of point sources in substantial noncompliance Elapsed time from identification of serious discharge violations until correction Number of targeted facilities/properties that

	have implemented BMPs Amount of fertilizer sold or used Number of estuary acres monitored Number of communities enacting zoning or stormwater management ordinances Number of public water systems with source water protection Number of public outreach activities and citizens reached
Quantify the extent to which actions have led to reduction in threats to surface or ground water quality	Reduction in nutrient loadings from each type of point and nonpoint source Reduction in pollutant loadings to ground water from underground injection wells Stability and condition of riparian vegetation Percent imperviousness upstream General erosion rate upstream Amount of toxicants discharged in excess of permitted levels Amount discharged by spills; number of businesses and households that have altered behaviors or processes to reduce pollutants
Measure the extent to which ambient water quality has changed	Pollutant concentrations in water column, sediments, and ground water Frequency, extent and duration of restrictions on water uses--bathing, drinking, fishing, shellfishing Percent of stream miles or lake or estuary

	acres that support each designated use Percent with impaired or threatened uses Percent of citizens who rate major water bodies as usable for various recreational activities
Measure direct effects on the health of humans, fish, other wildlife, habitat, riparian vegetation, and the economy of the region	Aquatic community metrics Reductions in waterborne disease in humans Size of wetlands or riparian habitat lost or protected Size of commercial and recreational fish harvest Increased jobs and income due to recreation

Develop Overall Project Goals

Next, the project team should develop a set of general goals reflecting a vision of the watershed in 10 to 20 years. Each goal should be backed by specific and quantifiable objectives that use environmental indicators to express the degree to which pollution must be prevented or controlled by given dates. Examples of watershed goals and objectives include:

- Eliminate all fish consumption advisories in the watershed within 10 years
- Reduce or eliminate incidence of blue-green algal blooms in a lake: reduce total phosphorus concentrations by 30 percent; maintain lake transparency as measured by Secchi disk depth at a seasonal mean of 2 feet
- Reduce edge of field sediment delivery by 50 percent and nutrient and agrichemical use by 20 percent in the watershed (USDA Sycamore Creek Watershed Hydrologic Unit Area [HUA], Michigan)
- Reduce the number and levels of contaminants present in public drinking water supplies.

- Stabilize 70 percent of the mileage of eroding stream banks in the watershed to prevent sedimentation downstream

- Eliminate the "supporting uses but threatened" classification by reducing sediment inputs to the main stream by 50 percent and reducing nitrogen concentration from 13 to 4 mg/L (Herrings Marsh Run Demonstration Project, North Carolina)

- Protect from degradation all remaining stream reaches with undamaged habitat and balanced aquatic communities

- Restore habitat in specified lakes and streams so they will support a reproducing game fish population

- Provide 100-foot riparian buffers along 20 miles of stream to lower water temperatures, provide wildlife corridors, and increase recreation

- Reduce the potential for nitrate and pesticide contamination of ground water (USDA Upper Tippecanoe River Watershed HUA, Indiana)

- Achieve biological standards for macroinvertebrates and fish in all streams in the watershed

- Develop TMDLs for nitrogen, phosphorus and sediment in the watershed.

The goals of the Anacostia River Restoration Program are shown in Highlight 7. Highlight 8 presents selected goals and objectives from the Klamath River Basin Restoration Program.

Set Interim Goals

Once overall project goals are determined, it is also useful to develop a series of interim goals that will document progress at each step of the project. The reason for establishing interim goals is that overall water quality goals--such as major improvements in achievement of designated use -- may be impossible to document in less than 5 to 10 years (or more for larger water bodies). In the meantime, administrative and interim water quality goals can be used to measure progress toward success:

Program Goals are goals for changes in the policies of agencies or other organizations. As an example, a goal for the agency responsible for road construction might be to require that runoff from all new roads discharge into buffer zones or detention ponds rather than directly to streams.

Activity Goals are those actions that will be taken by various participants. These goals are often expressed in terms of the number of activities to be accomplished--e.g., "the Department of Health will conduct 3 seminars for county sanitarians on proper septic tank installation" and "sanitarians will monitor performance of all new septic tanks in the watershed."

BMP Goals define which pollution control measures or other environmental improvement practices will be put in place, and where. BMP goals can be set for structural or nonstructural measures. These goals must relate to the pollutant or problem of concern, e.g., "stabilize and revegetate with native plants 3 miles of stream banks on Washout Creek adjacent to fields planted in soybeans" is a goal for stream bank protection and control of sedimentation.

Interim Water Quality Goals can sometimes be set where activities will produce improvements in the early years of the project. For example, installation of a new wastewater treatment facility or a change in land use may enable the rapid achievement of water quality standards in a portion of the watershed. Similarly, removal of instream barriers to fish passage may bring about rapid return of fish populations.

Highlight 7

Goals of the Anacostia Watershed Restoration Committee

The Restoration Committee set the following goals in a 1987 agreement:

Dramatically reduce pollutant loads in the tidal estuary to measurably improve water quality conditions by the turn of the century through: sewage overflow controls, urban stormwater retrofits (ponds, marshes, and filter systems), urban BMPs for new development, and control of trash and debris.

Protect and enhance the ecological integrity of urban Anacostia streams to enhance aquatic diversity and provide for a quality urban fishery through: urban stream restoration (channel and stream bank restoration) and stream protection (land use controls and BMPs within sensitive watersheds).

Restore the spawning range of anadromous fish to historical limits through removal of fish barriers and habitat improvement.

Increase the natural filtering capacity of the watershed by sharply increasing the acreage and quality of tidal and non-tidal wetlands through: wetlands protection (no net loss of wetlands in the watershed), urban wetlands restoration, and urban wetlands creation (several hundred acres).

Expand the range of forest cover throughout the watershed and create a contiguous corridor of forest along the margins of its rivers and streams through: forest protection, watershed reforestation and riparian reforestation (10 linear miles along the Anacostia in 3 years as a first step).

Make the public aware of its key role in the cleanup of the river and increase volunteer participation in watershed restoration activities.

Source: Metropolitan Washington Council of Governments, 1992.

Highlight 8

Goals and Objectives of the Klamath River Basin Restoration Program

The Klamath River Basin was once one of the most productive anadromous fish spawning areas on the West Coast. Physical barriers, habitat destruction, and pollutant loads have severely damaged this important commercial and tribal fishery. The long-range plan of the Klamath Restoration Program uses a "step-down" approach with specific goals, objectives, and policies or project priorities. Following is an example of a goal and a single objective under this goal.

Goal 1:

> Restore, by 2006, the biological productivity of the basin in order to provide for viable commercial and recreational ocean fisheries and in-river tribal (subsistence, ceremonial, and commercial) and recreational fisheries.

Objective 1: Protect stream and riparian habitat from potential damage caused by timber harvesting and related activities.

> Improve timber harvesting practices through local workshops; develop habitat protection and management standards for agency endorsement; create a fish habitat database; view existing regulations as minimum expectations

> Contribute to evaluating the effectiveness of current timber harvest practices through: developing an index of habitat integrity; incorporating fish habitat and population data into state water quality assessments; monitoring recovery of habitat in logged watersheds

> Promote necessary changes in regulations--State Forestry Practice Rules; Forest Service Policies in Land Management Plans, BMPs

> Anticipate potential problems by requesting additional state monitoring programs and by modifying State Forest Practice Rules and Forest Service plans to protect highly erodible soils and give priority to protection of unimpaired salmonid habitat.

Source: Klamath River Basin Restoration Program, 1991

Agree on Critical Actions

With a number of water quality problems, goals, and solutions to choose from, and limited funds, how does one decide which actions to take and in what order? Dealing with one source of pollution at a time (e.g., dairy runoff or urban stormwater) may seem to be the simplest approach, especially if the agencies and groups represented on the project team tend to specialize in one type of land management activity. This approach also allows easier documentation of progress in installing controls or changing behavior. The problem is that the "one problem at a time approach" rarely results in clean water! Typically, when one problem is fixed, other problems masked by the first problem become evident; the public gets disillusioned, and support for the project evaporates.

Successful watershed projects address all key sources of pollution at the same time. Not only does this approach make sense ecologically, it also makes good political sense--treating all significant sources diffuses the "blame" for pollution problems among many responsible segments of society. Less time is wasted arguing over who is more to blame when all agree they are part of the problem.

The project team should strive to emphasize certain problems that present greater risk to human health and the ecological health of the watershed. From lists of pollutants and sources and simple calculations of pollutant loads, some sources or types of pollution may be seen to contribute relatively high loadings of the targeted pollutants. Review of cost data will show that some management measures are more cost effective, and discussions with agency professionals will show that some measures are more effective in controlling pollutants than others.

At this point, brainstorming sessions are recommended to list "what if" scenarios involving different control measures and to get an idea of how one measure effects others. For example, some members of the project team may want to require nutrient management plans of all agricultural land owners, while missing the impact of lawn fertilization by urban dwellers. Such brainstorming sessions can help clarify what can be achieved without adversely affecting the community. Some projects prove too complex or controversial at this point. However, it is important to identify all political, social, and technical challenges before committing any money for solutions that might never be acceptable in a watershed.

Predictive tools such as watershed models are also available for estimating the relative effectiveness of watershed management strategies (e.g., EPA, 1992c; RTI, 1994). Using all available data and tools and professional judgments, decide upon the critical actions that would be the most effective ways to meet each of the specific goals of the project.

Most important, ensure that the agencies, local governments, citizen groups, and others who will be responsible for the selected management actions are capable of and willing to complete the actions.

Protect Critical Areas

Point and nonpoint source controls alone often may not result in achieving a watershed's goals for ecological integrity. A high percentage of our Nation's watersheds have experienced major changes in land use and, consequently, aquatic habitats have been damaged and biological communities have been compromised or lost. Undamaged habitat and fully functioning aquatic communities may remain in only a small number of places in a watershed--areas that are large enough to maintain viable populations of biologically diverse communities and small, isolated patches of habitat that are able to support some portion of their original biological communities. These critical areas may include headwater streams and portions of larger streams that have been protected by land ownership but may be subject to development pressures in the future.

Because such sources of biodiversity may provide the best hope for repopulation of watersheds with balanced aquatic communities, the protection of remaining critical areas or refuges should have a high priority when implementing watershed projects. This type of protection, which may be carried out through local land use regulations for protecting riparian buffers and flood plains or the purchase of conservation easements, can be more cost-effective than solving future problems after they occur.

Some resources in a watershed may be of such importance as to warrant special attention when implementing watershed projects. Such resources would include public water supplies and valuable ecosystems. Critical areas of sufficient size to adequately ensure the integrity of important resources can be delineated and managed. For example, source water protection areas, because they are delineated to protect ground water and surface water sources of drinking water, are obvious candidates for critical area designation (see Highlight 9, Nantucket, Massachusetts).

The bibliography in Chapter 9 includes references on protecting critical areas and on ecological restoration.

Highlight 9

Nantucket's Water Resource Protection Areas

In response to a variety of threats to Nantucket's water supply, the Nantucket Land Council, a private, non-profit organization, commissioned the development of a water resource management plan. Activities under the plan included the delineation of 12 water resource protection areas as areas designated for priority protection. Among these areas were wellhead protection areas for the island's two principal public water supply wells, a larger aquifer protection area designated as a source of future water supplies, and the drainage areas for coastal and freshwater ponds. The designated areas will be protected by a combination of regulatory and non-regulatory measures, including overlay zoning districts that regulate land uses, subdivision and wetlands regulations, on-going water quality monitoring, and public education campaigns on the residential use of lawn fertilizer and household chemicals.

Select Point Source Controls and Nonpoint Source Management Practices

Pollution control measures for both point sources and nonpoint sources benefit society as a whole but often do not provide an economic benefit to the individual or organization that installs them. Point source dischargers are used to this situation. Selecting management measures for nonpoint sources is apt to lead to contention, with some arguing for the least costly methods and others for the most effective regardless of cost. Many watershed projects rely upon voluntary implementation of BMPs, and incentives must be provided to encourage installation. The situation is further complicated by the difficulty in determining which measures really are most effective in protecting water quality.

EPA's Office of Water has prepared a major compendium of nonpoint source controls, *Guidelines Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (EPA, 1992d). This document describes appropriate management measures and management practices for each major category of nonpoint source (agriculture, forestry, urban, etc). A management measure is an economically achievable system of nonpoint source control practices that reflects the greatest degree of pollutant reduction achievable. States with coastal management programs are required to implement these management measures; states are not required to implement specific management practices (often called BMPs), but watershed project teams may choose to do so. Example management measures and practices are given in Table 6-2.

For purposes of this *Project Focus* document, the term BMP applies to any type of nonpoint source management practice (structural, nonstructural, vegetative). There is a tendency for projects to select the most "palatable" measure (e.g., those BMPs most likely to be implemented on a voluntary basis). Unfortunately, at the end of some watershed projects the primary water quality problem has not been solved even after BMP-type goals have been achieved or exceeded. This can occur for many reasons; e.g., the water quality goal was inappropriate; the wrong BMPs were selected; BMPs or restoration techniques were installed in the wrong places.

Selection of BMPs is a site-specific activity and is beyond the scope of this document. The project team should rely on its own expertise, but should also seek advice from those who have faced these challenges in similar watersheds. Outside expertise may be especially important when nontraditional stressors such as aquatic habitat loss are involved. Following are some items to consider when choosing management practices (see also Highlight 10):

Evaluate the land use in the watershed. Is it likely to stay the same or change drastically because of changing economic or social conditions?

Realize that there are several types of management practices including structural, vegetative, and nonstructural (e.g., conservation tillage). The key to effective pollution control often is to use them in concert with education and, if appropriate, regulation. A single type of management practice is seldom sufficient to solve a watershed's problems.

Consider protecting buffer zones around receiving waters as a last line of defense between sources and water bodies. The U.S. Forest Service provides specifications in Riparian Forest Buffers: Function and Design for Enhancement in Water Resources (Welsch, 1992). A forest buffer less than 100 feet wide can protect water quality and enhance aquatic habitat.

Review published information about BMP design, installation, and effectiveness and obtain help from technical experts on the project team. See the bibliography in Chapter 9 for sources of information. Also refer to SCS Field Office Technical Guides (county-level) for watershed-specific information.

Prioritize the measures available for each source and pollutant/stressor and decide which should be implemented first. This decision should be based on the estimated water quality effectiveness of the measure as well as its cost.

Select priority BMPs and other measures for each source and pollutant/stressor of concern in the watershed so that they may be installed simultaneously.

Consider innovative approaches that link point and nonpoint source management, e.g., pollutant trading.

Table 4. Example Nonpoint Source Management Measures and Practices

Type of Nonpoint Source	Example Management Measure	Corresponding Management Practices
Confined Animal Facilities (small units)	Design and implement systems that collect solids, reduce contaminant concentrations, and reduce runoff to minimize discharge of contaminants in both facility wastewater and in runoff from up to a 25-year, 24-hour storm. Reduce groundwater loadings. Manage stored runoff and accumulated solids through an appropriate waste utilization system.	Waste storage ponds Waste storage structure Waste treatment lagoons Filter strips Grassed waterways Constructed wetlands Dikes Diversions Heavy use area protection Lined waterway/outlets Roof management systems Terraces Composting facility
Forestry	Streamside Management Areas (SMAs) Establish and maintain a streamside management area along surface waters, which is sufficiently wide and which includes a sufficient number of	Generally, SMAs should have a minimum width of 35 to 50 feet, increasing according to site-specific factors (e.g., slope, class of watercourse, depth to water table, type of soil and vegetation, and intensity of management)

	canopy species to buffer against detrimental changes in the temperature regime of the water body to provide bank stability, and to withstand wind damage. Manage the SMA in such a way as to protect against soil disturbance in the SMA and delivery to the stream of sediments and nutrients generated by forestry activities, including harvesting. Manage the SMA canopy species to provide a sustainable source of large woody debris needed for instream channel structure and aquatic species habitat.	Minimize disturbances that would expose the mineral soil of the forest floor. Do not operate skidders or other heavy machinery in SMA Locate all landings, sawmills, and roads outside the SMA Restrict mechanical site preparation in the SMA; encourage natural revegetation, seeding, and hand-planting Limit pesticide and fertilizer usage in the SMA. Buffers for pesticide application should be established for all flowing streams Directionally fell trees away from streams to prevent slash and organic debris from entering the water body Apply harvesting restrictions in the SMA to maintain its integrity
Agricultural Land (cropland, range and pasture, orchards, specialty crops, etc.)	Erosion and Sediment Control Management Measure Apply the erosion component of a Conservation Management System (CMS) as defined in the Field Office Technical Guide of the U.S. Department of Agriculture - Soil Conservation Service (See Appendix A of this chapter) to minimize the delivery of sediment from agricultural lands to surface waters, or	See EPA 1992d for detailed descriptions of these) Conservation cover on land retired from production Conservation cropping sequence Conservation tillage Contour farming Contour orchard an other fruit areas

	Design and install a combination of management and physical practices to settle the settleable solids and associated pollutants in runoff delivered from the contributing area for storms of up to and including a 10-year, 24-hour frequency.	Cover and green manure crop Critical area planting on highly erodible or critically eroding areas Crop residue to use to protect cultivated fields during critical erosion periods Delayed seed bed preparation Diversion Field border Filter strip Grade stabilization structure Grassed waterways Grasses and legumes in rotation Sediment basins Contour strip-cropping Field strip-cropping Terrace Water sediment control basin Wetland and riparian zone protection

Source: EPA, 1992d

Highlight 10

Watershed-wide Controls in the Anacostia

Water quality problems in the Anacostia are attributed to urban sources such as combined sewer overflows, stormwater runoff, and erosion from construction sites. In addition, widespread habitat destruction has occurred due to increased peak flow rates, channelization, sedimentation, and barriers to fish movement.

Efforts in the first few years of the Anacostia Restoration Program have focused on beginning improvements in nine priority sub-watersheds. Within each priority sub-watershed, a Sub-watershed Action Plan (SWAP) is prepared as a blueprint for restoration activities. SWAPs are prepared with input and participation of all local, State, and Federal agencies with an interest in the sub-watershed, and each plan is unique.

SWAPs typically detail the locations and timing of a combination of measures--retrofitting of urban stormwater controls to modern designs that reduce pollutant loads, improvements to instream habitat, and restoration of wetlands or riparian buffers. Early projects in sub-watersheds are described below:

Sligo Creek Sub-watershed (Wheaton Branch)--construct an extended detention pond/marsh system to remove pollutants and reduce magnitude of destructive flood events. Downstream, stabilize banks and create structural habitat instream using boulders, notched log drop structures to create pools, stone wing deflectors to create riffles; also, reforest the flood plain.

Indian Creek Sub-watershed--retrofit an existing dry stormwater facility to create a dry, extended detention facility to control runoff from 1.65 square miles.

Paint Branch Sub-watershed--Restore the main stem portion of Paint Branch including riparian reforestation and a series of in-stream fish habitat improvements, initially involving 2000 linear feet of stream.

Sources: Metropolitan Washington Council of Governments, 1990

Target and Schedule Point and Nonpoint Source Controls

This is the "heart and soul" of the developing watershed action plan. It involves reaching agreement to implement point source controls and nonpoint source management measures within a certain time frame. These practices include critical BMPs and other control and restoration practices in particular areas (e.g., near critical aquatic habitat or in areas contributing the most pollutant loads). Management measures also may involve seeking local ordinances or redirecting agency resources and programs.

In this stage of the project, planners often fear that the agreements secured from stakeholders will evaporate. However, committing to a specific schedule is essential; allow additional negotiating time on this step to make sure everyone involved in the project is clear and in agreement to the extent possible.

Agencies and local government are the keys to this activity because they must agree to focus activities and funds on discrete areas. If agreement is difficult:

Seek to reach consensus on at least one critical redirected action for each agency and special interest group on the project team.

Encourage early (1 year) implementation of some measures by each responsible or designated agency or group. It is vital that the public know "that someone is finally doing something," and it is important that the agencies establish a precedent for action.

The project team may want to consider seeking "bad-actor" regulations at the local level at this point. In most watershed projects, individuals are given incentives (technical assistance, cost-share funds, tax advantages) to install certain BMPs. If the BMPs are not installed and it is determined by the local committee or agency that the property is still causing a water quality problem, then bad-actor regulations can require that fines or other penalties be assessed.

It is important to stress that watershed projects do not operate in a vacuum; management measures should be compatible with other water quality programs to the extent possible (e.g., statewide watershed management efforts).

Prepare a Watershed Action Plan

A watershed action plan documents everything that has been learned and agreed upon prior to actually implementing management measures. The primary topics are usually the watershed inventory, water quality problems and their sources, indicators, goals, agreed-upon actions, a funding plan, and commitments from participating agencies.

Some type of formal action plan is important because it clarifies for those outside the decision-making process (and even for the decision makers themselves) exactly what needs to be done in the watershed and how it will be accomplished. A useful side benefit of a plan is that affected parties (e.g., industrial dischargers, farm groups, urban developers) see that they are not the only individuals who are being asked to help improve water quality. Further, an action plan demonstrates to the public and political interests that there is a broad-based commitment to progress.

Local committees and agencies often do not have all the required expertise to prepare watershed plans. Some states provide technical assistance for watershed planning. Highlight 11 discusses efforts by state and federal agencies to provide support to local watershed committees in the State of Washington. Highlights 12 and 13 show contents of watershed action plans from Puget Sound and Wisconsin.

Highlight 11

Interagency Technical Assistance Teams in Puget Sound

In the Puget Sound basin, local committees seeking funding for watershed projects are required to prepare action plans for control of nonpoint sources. The Washington Department of Ecology (DOE) formed the Interagency Technical Assistance Team to support these committees. The team consists of representatives from over 20 State agencies with expertise in: Agricultural and forestry BMPs Technical transfer to the agricultural community Surface water quality monitoring and assessment Groundwater protection Stormwater management Shellfish protection Public involvement strategies Wildlife management Habitat protection.

In addition, a Puget Sound Cooperative River Basin Study Team was formed with representatives from the Soil Conservation Service, the Forest Service, the Washington Department of Fisheries, and DOE. This team helps evaluate land use water quality problems within watersheds through field and literature investigations, provides management alternatives, and produces reports and maps based on watershed information.

Source: Puget Sound Water Quality Authority, 1991.

Highlight 12

Developing an Action Plan

The Puget Sound Water Quality Authority's Nonpoint Rule requires watershed management committees to include, at a minimum, the following elements in their action plans:

A watershed characterization, including information such as watershed maps, geographic and biological information, and sources of data on the watershed.

A water quality assessment identifying nonpoint sources of pollution and evaluating water quality, beneficial uses, and the biological health of the watershed.

A problem definition indicating the extent of existing and potential water quality problems and effects on beneficial uses from nonpoint sources in the watershed.

Goals and objectives for prevention and correction of these nonpoint pollution concerns.

Specific source control programs to address the problems identified and justification for the management actions proposed in each of these programs. Source control programs can apply to stormwater and erosion, agriculture, on-site sewage disposal systems, forest practices, boats and marinas, and other nonpoint sources.

An implementation strategy identifying specific actions required, the responsibilities of each implementing agency or entity, and project milestones, costs, and funding sources.

Highlight 13

Black Earth Creek Priority Watershed Plan

The Wisconsin Department of Natural Resources (WDNR) works with other State agencies and local governments to target watersheds for intensive nonpoint source management. Once they have been targeted, Priority Watershed Plans are developed by local agencies in cooperation with WDNR.

The Black Earth Creek Watershed Plan was prepared in cooperation with the Dane County Land Conservation Department and approved by the County Board of Supervisors in 1989. Trout Unlimited, the Black Earth Watershed Association, USGS, and SCS also provided input to the plan.

Contents of the Priority Watershed Plan included:

- Letters of approval by agencies
- Introduction, purpose, and legal status
- Physical description of the watershed
- Water resources conditions, objectives, and control needs (by sub-watershed)
- Point sources
- Nonpoint source control activities
- Fish management and related activities (e.g., habitat protection)
- Coordination activities among agencies
- Detailed program for implementation
- Evaluation and monitoring program.

The bulk of the plan is a section on water resources conditions, objectives, and control needs. This section presents detailed information for each sub-watershed in the Black Earth Creek watershed. For example, in one sub-watershed, nonpoint source control needs include:

Cropland management--control erosion on 1,820 acres of land having high erosion rates

Stream bank management--control bank slumping on three small sites

Animal lot management--achieve a 79 percent reduction in phosphorus loading by additional controls at six of the eight livestock operations

Manure management--prepare manure spreading management plans for the eight livestock operations

Cropland management--purchase and retire from crop production an area having high organic soils and excessive phosphorus losses

Urban lands management--have builders comply with existing construction regulations; ensure that new industrial development includes additional controls such as wet basins

Ground water protection--protect lands adjoining a major spring area via acquisition, rental, or easement

Fishery management--improve stream habitat (excessive sediment and aquatic vegetation) in a stretch of about 1 mile supporting a trout fishery.

Source: WDNR and Dane County Land Conservation Department, 1989.